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Retrieving Movement Memory With and Without the Use of Musical Cues

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Retrieving Movement Memory

With and Without the Use of Musical Cues

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Abstract

The purpose of this study was to investigate the relationship between learning and retrieving movement with and without musical cues. Twenty-three students all of whom had not had any formal dance training participated in this study. The subjects were required to make two visits for data collection purposes. Testing included performance of the "Mayim" folk dance on day one and then again on day two. Subjects in groups one and two learned the dance with music and subjects in groups two and three learned the dance to the beat of the metronome. On their second visit, groups one and three performed the dance with the music while groups two and four performed the dance with the metronome. It was hypothesized that the subjects who learned the folk dance with the music would be able to perform the folk dance better than the subjects who learned the folk dance without the music and that the recall performance of the folk dance would be greater by the subjects who had the music as their cue rather than by the subjects who only had the metronome as their cue. However, the results indicated that learning the folk dance with and without the music did not produce any significant performance differences. Yet there were significant differences found between the movement performance scores on day one and day two ($F=4.004$, $p<.05$). The groups' total movement scores for days one and two went from a mean of 95.3 down to a mean of 78.8. Although no significant differences were found between the groups on day 2, three out of the four groups showed a decrease in retention performance. The results of this investigation did not provide enough evidence to support the theory that music does enhance one's ability to recall movement with the aid of musical cues.

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Introduction

Dancing to music is a naturally occurring phenomenon. As stated by Worden (1998), "Movement to the rhythm found in music is a natural part of the listener's response." After much rehearsal, the synchronization that occurs between the dance movements and the music as performers dance appears as an obvious connection to the novice viewer. However, without much rehearsal, are the dance performers able to use musical cues to aid in the memory and retrieval of the dance movements? Since music has been found to effectively stimulate memory recall of verbal text (Wallace & Rubin, 1991: Bartlett & Snelus, 1980), can music have the same effect for memory recall of movement text?

Typically dance teachers teach the movement first and the music is added second (Puretz, 1987). Thus, the music becomes the dancer's cues for the timing of the movement. Although, auditory information may be present during instruction and performance, the dancers are not being made aware of its presence (Wuyts & Buekers, 1995). Experienced dancers then form synchronization between the dance movements and the musical cues. Is this occurrence restricted to experienced dancers only or is this a naturally occurring phenomenon that happens with novice dancers as well?

Since it has been effectively shown that recall of verbal text can be stimulated by music (Wallace & Rubin, 1991, Bartlett & Snelus, 1980), music should help stimulate the recall of movement sequences. Music is able to assist recall because it acts as a framework for both encoding a text and retrieving a text. During encoding, or the learning stage, the melody provides the connections between the lines and phrases that

assist in learning. During retrieval, the melody provides a framework that indicates how much information must be recalled, where information has been omitted, as well as the order of segments. In fact, recall of song lyrics is greater when cued with the melody than when cued with the title of the song (Bartlett & Snelus, 1980). Rubin (1977) found that subjects were able to recall more of a text when provided with the melody of a song than when given no cue.

Discussion

People have been moving to music as long as music has been playing. In fact, Plato wrote, "To sing well and to dance well is to be well educated" (Lawler, 1964, p. 124). Music has been used as the inspiration for a dance or just used as the metronome for the dancers to keep time. Specifically, folk dances have been used by educators since the early 1920's (Harris, Pittman, & Wallace, 1994). Folk dances have been widely used in physical education beginning at the elementary level and continuing through the college level. Even in the primary grades, children frequently are able to perform simple folk dances in a synchronized manner (Campbell & Scott-Kassner, 1995). Music used with each folk dance is important. The music is organized and it sets the style, tempo and quality of the dance movements.

According to Wuyts and Buekers (1995), the ability to synchronize complex movement patterns to the rhythms of the music can be considered basic skills of an expert dancer. As a result of training, dancers learn to find the beat and rhythm in music. Piro (1993) used dancers in his study concerning the effects of music perception because it was theorized that as dancers form their dance movements, they respond to music

utilizing a cognitive approach that encourages combining the dance and music together rather than keeping the two parts separated. In other words, dancers respond to music primarily with their kinesthetic sense. The question that needs to be answered then is, can novice dancers make the connection between the movement sequence and the musical cues.

Using the music as a tool for dance retention should be an advantage for teachers and instructors. Pointing out the musical or auditory cues that the dancers will hear, will help facilitate the learning process. Another conjectural advantage is that the speed at which the learners learn the movement should happen at a faster rate. Doody, Bird, and Ross (1985) demonstrated that better performance was achieved by learners who received visual demonstrations along with auditory cues.

Since music aids in memory retention, a third postulated advantage is that students will be able to retain or will be able to recall the movement that was learned over a greater length of time. Thus, at a later date, if the student hears the music, his/her kinesthetic sense will be stimulated and the student will be able to recall what movement happened on the auditory cue. The student will then be able to piece together what preceded and what followed that movement enhancing the sequence of movement. With these auditory cues, the performer should then be able to remember more of the movement sequence than without the aid of musical cues.

Statement of Purpose:

The purpose of this investigation was to answer the following research questions:

I. What was the differential effect of music versus no music during the learning process?

Learning was measured using the outcome variables listed below:

A. Performance execution and correct sequence of the movement

II. What was the differential effect of music versus no music during recall?

Recall was measured using the outcome variables listed below:

A. Performance execution and correct sequence of the movement

III. Was there an interaction between the groups and the day of testing?

Delimitations:

The participants in this study consisted of twenty-three students from the College of Education at the University of Nebraska at Omaha. All subjects had to be in good apparent health with no medical conditions and no formal dance training. The participants were asked to learn the folk dance "Mayim" on their first visit and one week later they were asked to come back and recall the folk dance from memory.

Limitations:

The time between the two visits may have been a limitation to the study because it may not have been the best length of time to accurately determine if music was an effective stimulant for movement recall. Having only twenty-three subjects may have also been a limitation of the study. A third limitation may have been the subjects' own ability to recall movement. A final limitation may have been the accuracy of the judges' scores.

Hypotheses

The following research hypotheses were tested in this study:

1. Subjects who learn the folk dance with music will have higher performance execution

scores than the subjects who learn with a metronome.

2. Recall of movement sequences will be greater by the groups who are given the music as their auditory tool versus the groups who are given the metronome as their auditory tool.

Definitions

For clarity, the following terms are defined:

Beat: The temporal unit of a composition. In moderate tempo, the 4/4 measure includes four beats, the first and third of which are strong, the others weak.

Lyrics: The words of a song.

Melody: Rhythmic arrangement of tones in sequence to express a musical idea. Also known as a song's tune.

Metronome: Instrument used to help a person maintain tempo.

Observational Learning: The reproduction of a novel pattern of action following the visual observation of one or more correct performances of the new movement pattern. (Doody, Bird, & Ross, 1985).

Rhythm: The entire feeling of movement in music with a strong implication of both regularity and differentiation; regular occurrences of grouped strong and weak beats.

Tempo: Rate of speed at which the music is played.

Significance of Study

From a scientific view point, this study can give us a better understanding about how movement information is encoded and retrieved. Using a variety of subjects will provide the chance to note how different teaching techniques help people learn and retain

movement combinations.

From a practical point of view, this study can show how music can be used as a tool for retention. This can be an advantage for dance and physical education teachers. It is possible that students will be able to learn movement combinations better as well as remember movement combinations over a longer period of time.

Chapter II

Review of Literature

The purpose of this study was to find out if there are interconnections between musical phrases and movement sequences. The relationship between multiple modes of presentation, specifically auditory and visual, will also be discussed. Information regarding teaching movement sequences and recalling movement sequences with music is limited in the literature. Discussed in the following sections will be studies regarding multiple sensory modes of presentation, a study on the effect of enactive encoding on memory of dance and finally studies that emphasize the effect of music on memory.

Studies Regarding Multiple Sensory Modes of Presentation

Various instructional procedures have been under investigation for a long period of time. Most instructors employ only one mode of learning when they teach. Students are listening or students are reading. Nazzaro and Nazzaro (1970) wanted to investigate if visual learning occurs more easily than audio learning. In their experimental design, they created a serial-learning task of Morse code triads in order to assess the difference between the two modes of learning. Nazzaro and Nazzaro hypothesized that auditory learning of Morse code triads should occur more rapidly than visual learning due to a shorter encoding process. It had been suggested that short-term memory is based on auditory encoding even if the stimuli presented were visual. Their results (Nazzaro & Nazzaro, 1970) indicated that auditory stimuli were learned significantly faster than visual stimuli. They also showed that when the visual model was taught before the auditory model, the difference between the mean number of trials to criterion was 8.87

trials. Conversely, when the auditory model was presented first, the difference between means was 1.37 trials. Auditory presentation required 3.75 fewer trials to criterion compared to the visual presentation, regardless of order of presentation.

A study done by Doody, Bird, and Ross (1976) tested the hypothesis that the presentation of either an auditory-only or auditory+visual model would be more effective during the learning of a motor task that involved timing accuracy than the presentation of a visual-only model. Forty-eight female subjects were divided into four groups, the control, audio-only, visual-only, and audio+visual group. The results of their experiment showed that for all the trials combined, both groups that learned with the audio had lower absolute errors than the other two groups. Thus, they concluded that the presence of an auditory model, regardless of the presence or absence of a visual model, appears to have been the critical factor in the acquisition of the skill. Consequently, the exposure to a model of correct performance which includes an auditory representation of the relative timing within a motor performance leads to better transfer performance than exposure to a model which provides only the visual representation of the spatial and temporal aspects of the task.

Carroll and Bandura (1990) combined modeled demonstration with verbal cueing and predicted that this would produce a higher level of cognitive representation. Using a paddle action sequence that they had designed, half of the subjects received a modeled demonstration while the other half of the subjects received concurrent verbal cueing along with the modeled demonstration. Carroll and Bandura concluded that multiple exposures to modeled actions increased the accuracy of both the cognitive representation

and behavioral production of the action. Verbal cueing also enhanced the accuracy of both the cognitive representations and behavioral reproductions.

Wuyts and Buekers (1995) further expanded on the work of Carroll and Bandura and Doody, Bird and Ross. The purpose of their study was to explore the effects of the type of modeling that is used in order for subjects to replicate a rhythmical synchronization skill. They hypothesized that subjects who were given concurrent visual and auditory instruction would perform better than those subjects who just observed a visual demonstration. Twenty male and female college students were used as the subjects. None of the subjects in the experiment had any musical or dance training. The subjects were divided into four different groups. An audio-visual group, audio-auditory group, auditory group and visual model only group. Results of their experiment showed that the condition of concurrent modeled information showed an immediate effect on timing performance. However, because there were so many practice trials, not having concurrent modeled information could have been compensated by practice. Subjects who were provided with both the auditory and rhythmical phrases and concurrent modeled information about the beats had the lowest error scores. Wuyts and Buekers (1995) were able to conclude that the condition of auditory modeled information during learning improved performance more than did the presentation of visual modeled information, but did not guarantee better permanent learning effects.

In a series of two experiments, Tindall-Ford, Chandler, and Sweller (1997) wanted to expand on why two modes of sensory presentation (visual and audio) were better than just one mode of sensory presentation (visual or audio). A study done by

Mayer and associates demonstrated the superiority of dual-mode instructions and suggested that an audio-visual format is superior only when the audio and visual information are presented simultaneously rather than sequentially. They label this phenomenon the contiguity effect. This effect implies that audio+visual instructions are superior to audio-visual instructions where the audio and visual segments are presented separately.

In Tindall-Ford et al's (1997) first experiment they compared audio-visual instructions with visual-only instructions. The instructional materials consisted of information relating to four electrical tests of an electrical appliance. Subjects were placed into one of three groups. The first group used a visual only instructional format. The second group used an audio-visual format and the third group of subjects used an integrated format of audio and visual instruction. Tindall-Ford et al. (1997) were able to conclude that an integrated audio-visual instructional format resulted in superior understanding of information presented. They were able to explain this by means of the assumption that using both the auditory and visual channels allows those aspects of working memory with both channels to be utilized.

In their second experiment (Tindall-Ford et al. 1997), the purpose was to provide measures of cognitive load. They did this by asking the subjects to indicate on a rating scale how difficult they found each learning task. The audio-visual group rated its instructional materials lower in mental load than the visual-only group. Furthermore, efficiency measures that combine both subjective mental effort and performance indicated that as an instructional technique, the audio-visual procedure was substantially

superior to the visual-only procedure.

Studies on the Memory of Dance Sequences

In the past, studies that have examined recall of more complex motor movements have applied physical education activities as the source movements. Puretz (1987) decided to look at the recall of retrieval strategies for dance movements. Recalling a motor pattern from long-term memory involves some type of retrieval strategy. The recall strategy that Puretz wanted to focus on was the use of rehearsal. For her study, she defined rehearsal as a "conscious process that aids in the recovery of material." The rehearsals may involve physically replicating the criterion movement which is referred to as overt rehearsal. The rehearsals may also involve mental review or imagery of the criterion movement and this is referred to as covert rehearsal. The study was designed to test whether conscious rehearsal was necessary to produce replications of complex dance movements stored in long-term memory and, if so, which type of conscious rehearsal, overt or covert, produced better results. A 16-count movement phrase was used and a 3x3 experimental design was used. Retrieval times that were used were ½ hour, 2 days later and 1 week later. The three levels of rehearsal were physical practice, mental practice and no practice. All the subjects had to practice the criterion movement until they could demonstrate the movement at an acceptable replication standard. Results of the study indicated that class time does not have to be used by inexperienced dancers physically or mentally reviewing a previously learned dance sequence because no conscious rehearsal provides the same quality of movement reproduction. Retrieving a dance skill from long-term memory does not necessarily require conscious rehearsal

before replication. The results of this experiment confirm that a dance-movement pattern, once entered into the long-term memory store, can be physically recreated despite a lapse of several days without practice. However, these findings apply to subjects who are basically inexperienced. Fuchs (1962) has stated that the level of analysis or the parameters encoded may change as the performer becomes more proficient so recall and recognition schema for experienced dancers might be very different from those of present beginners.

Foley et al. (1991) wanted to examine the effects of encoding on memory of sequential dance movements. They were interested in investigating the importance of the availability of verbal descriptions and internal motor representations on memory of self-performed tasks by varying the commonality of the actions. This advantage in memory of self-performed tasks is known as the SPT effect. In their study, two groups consisting of dancers and non-dancers, were used as the subjects. They hypothesized that since dancers are already familiar with the components of the movement sequences, they should be more likely than non-dancers to encode their movements verbally. In other words, even though the dance sequence would be new to the dancers, the steps themselves would not be. On the other hand, for the group of non-dancers, both the steps and the sequences would be new or unfamiliar to them. Subjects were asked to perform a series of movement sequences and then asked to recall these sequences enactively. In order to receive credit for correct performance, the subjects had to perform each movement in its correct location in the sequence. Results of their study showed that the availability of verbal descriptions and motor representations are not essential for the

production of an SPT effect, since both subject groups demonstrated an SPT effect for uncommon movements.

A characteristic of verbal recall is that items are recalled in groupings known as "chunks" or "clusters" (Longstaff, 1998). Longstaff (1998) wanted to see if clustering might also occur in the free recall of body movements. It has been shown that memory capacity can be increased by recoding more and more bits within each chunk and the amount recalled increases over several recall trials through the "subjective organization" of stimuli into larger "chunks." This benefits recall performance since a group of items are recalled together as one from a "higher-order memory unit" rather than each item being recalled separately. When simply presenting the stimuli list to the subjects, the subject then arranges them in a sequential order which minimizes the performance demands of memory recall. Past studies using measures of clustering have exclusively used words as stimuli. This experiment attempted to discover if subjective organization also occurs in the free recall of body movements. This would be a characteristic that could be used to probe cognitive structures of motor memory in a similar manner that has been done for cognitive structures of knowledge areas inferred through verbal performance. In this approach, the items being learned and recalled are actual body movements rather than names of body movements. This will ensure that motor memory is accessed rather than verbal memory of motor concepts. Results of this experiment indicate that subjective organization occurs in the recall of abstract, unfamiliar movements. As greater numbers of movements were learned, the amount of organization also increased.

Starkes, Deakin, Lindley and Crisp (1987) wanted to see if expert dancers could recall more than novice dances. They used two groups of children. The expert group consisted of eight children who were students of the National Ballet School. The novice ability group consisted of eight children who attended local ballet schools. Each subject watched a videotape sequence of eight ballet movements performed twice by a skilled adolescent dancer. Two types of dance sequences were used. A structured sequence which consisted of ten sequences of professionally choreographed ballet movements and an unstructured sequence that consisted of the same dance elements that was in the structured sequences except they were put in a random order. Then each subject was asked to recall the eight movements by either verbally recalling the sequence or by actually performing the sequence. It was noted that the novice dancers hurried to perform or verbalize what they had seen. The group of expert dancers asked if they could take time to think about the sequence before they performed it. During this short rehearsal time, small hand and foot movements were observed and these movements represented the eight movements they had just seen. It was also shown that the structured dance sequences led to enhanced recall of the dance sequences especially for the expert group of dancers.

Studies that Emphasize the Effect of Music on Memory

When music is going to be used as the stimulus for memory, the rhythmical structure of the music is important. Rubin (1977) demonstrated this effect by asking subjects to recall the lyrics to "The Star Spangled Banner." To set up his experiment, Rubin used the work of Glanzer (1976), who hypothesized that listening to the proper

rhythm should increase the amount recalled and listening to the wrong rhythm should decrease the amount recalled, as his model. One group of subjects were asked to recall the lyrics without any music playing, another group listened to "The Star Spangled Banner" music playing and a third group of subjects listened to the "Stars and Stripes Forever" music playing. During the experiment, Rubin noticed that the group of subjects who were listening to the correct music would write as fast as they could until the music got ahead of them. Then by the second and third repetition of the music, the subjects would wait until the music came around to where they had stopped writing and then begin writing another burst until the music got ahead of them again. This pattern of writing showed that where a rhythmic structure is available, subjects could make use of this structure to begin remembering the sequence again after a unit has been forgotten.

Expanding on the work done by Rubin (1977), Bartlett and Snelus (1980), set out to prove that a song's melody would be a better cue than the song's title for the recall of song lyrics. Middle-aged and elderly adults were asked to listen to melody and title-cues for popular songs dating from 1921 to 1974. Their data showed that cued recall of lyrics were higher in response to melodies than in response to just the titles of the song.

Building on the work of the previous investigators, Wallace (1994) wanted to determine how music aids learning and recall of text and when the text is more memorable with music. First Wallace addressed what characteristics of the melody are critical for facilitating recall. By listening to the melody of the song, the subject is given important information about the lyrics. For instance, the subject learns the length of the accompanying textual line, how many syllables belong on that line and how many

stressed syllables occur on that line. Additionally, the subject is provided with sequential information which provides an order of encoding and a comparable order of recall about the lyric phrases. Thus, the sequential recall limits the likelihood of skipping over portions of the material without being aware of the omission. The melodic structure also provides an access point from which one can pick up recall again even if a portion is omitted. A melody can also provide constraints for text recall, so that if a portion of the text cannot be readily recalled, then there is a high probability that the correct text can be generated or reconstructed.

The first experiment that Wallace conducted was designed to show that music could expedite recall of text. Subjects heard three verses of a ballad that were either spoken or sung and then were asked to recall in writing the text that they had heard. The resulting data showed that absolute recall was significantly greater ($F(1,60)=19.95$, $p<.0001$, $Mse=0.05$) for the sung condition than for the spoken condition.

The second experiment that Wallace conducted was designed to assess whether music contributes more than just the rhythmical structure. In 1988, Wallace and Rubin showed that recall of text is better when the text is spoken to a background beat than when the text is merely spoken. This is an indication that rhythmical structure can facilitate recall of text. Subjects heard one of three verse ballads five times either sung or spoken with a rhythmical intonation, which emphasized the rhythmically stressed syllables. In the background, a metronome tapped in synchrony with the verses. The subjects were then asked to recall the text of the ballad in writing after the first, second and fifth repetitions. After a delay of twenty minutes, subjects were asked to recall the

ballad again. Again it was the sung condition that resulted in a more comprehensive recall than the rhythmical condition. However, music should not help recall if the match between the text and the melody is a poor one. This is because the interconnections between the music and melody are not apparent.

In a continuation of their study, Starkes et al. (1987) carried on their work with dancers to see if the presence of music at the time of recall aided retention. Eight students from the National Ballet School in Canada were used as subjects. These dancers were considered expert dancers and had an average of 5.1 years of ballet experience. Subjects watched a video tape of an expert dancer performing choreographed sequences that were similar to what they used in their first experiment. Each sequence was viewed twice and then they performed a motor recall of the sequence immediately. Each dancer viewed the sequence done with the music. However, in the no-music condition, subjects recalled the sequence without the music. Results from the experiment showed that subjects performed the no-music recall condition with greater error and faster than the music condition recall. It also appeared that the music did act as a cue in enhancing recall. When recall would normally begin to decrease, the music appeared to provide enough cues to maintain recall of up to eight dance elements. Thus, the investigators in this experiment pose the question of how long the sequence can be for the music to act as a retrieval cue.

Summary

From this literature review, it becomes clear that music does indeed have a positive effect on the recall of lyrics. Selected studies are summarized in Table I. It is

also evident that dual modes of sensory presentation aid in the learning of new movements. However, what is not clear is whether movement phrases can take on the same characteristics as lyric phrases. Therefore, it is necessary to conduct further research into this area. This will provide more knowledge on this subject area and may lead to new developments in the field of movement education.

Table I. Selected Studies Reviewed

Author	Year	Design	Results
Nazzaro et al.	1970	Determine if visual learning occurs more easily than audio learning.	Auditory stimuli were learned significantly Faster than visual learning.
Doody et al.	1976	Compare the presentation of either an auditory-only or auditory+visual model would be more effective during the learning of a motor task that involved timing accuracy than the presentation of a visual-only model.	The presence of an auditory model regardless of the presence or absence of a visual model appears to have been the critical factor in the acquisition of the skill.
Rubin	1977	Demonstrate that the rhythmical structure of music is important if it is going to be used as the stimulus for memory.	Subjects pattern of writing showed that where a rhythmic structure is available, subjects could make use of this structure to begin remembering the sequence again after a unit has been forgotten.
Bartlett et al.	1980	To prove that a song's melody would be a better cue than the song's title for the recall of song lyrics.	Cued recall of lyrics were higher in response to melodies than in response to just the titles of the song.
Puretz	1987	Investigate the recall of retrieval strategies for dance movements.	A dance-movement pattern once entered into the long-term memory store can be physically recreated despite a lapse of several days without practice.
Starkes	1987	Determine if expert dancers could recall more than novice dancers.	Structured dance sequences, rather than un-structured led to enhanced recall of the dance sequences especially for the expert group of dancers.
Carroll et al.	1990	Ascertain if combined modeled demonstration with verbal cueing would produce a higher level of cognitive representation.	Multiple exposures to modeled actions increased the accuracy of both cognitive representation and behavioral production of the action. Verbal cueing also enhanced the accuracy of both the representations and behavior reproductions.
Foley et al.	1991	Examine the effects of encoding on memory of sequential dance movements.	The availability of verbal descriptions and motor representations are not essential for the production of an SPT effect since dancers and nondancers demonstrated an SPT effect for uncommon movements.
Wallace	1994	Determine how music aids learning and recall of text.	Verbatim recall was significantly greater for the sung condition than for the spoken.
Wuyts et al.	1995	Compare audio-visual instructions with visual-only instructions using a dance combination.	Audio-auditory group produced lower error scores during the learning stage and no differences noted during the retention stage.
Tindall-Ford et al.	1997	Compare audio-visual instructions with visual-only instructions.	Integrated audio-visual instructional formats resulted in superior understanding of information presented.
Longstaff	1998	Examine if clustering might also occur in the free recall of body movements.	Subjective organization occurs in the recall of abstract unfamiliar body movements. Greater number of movements that were learned increased the amount of organization needed.

Chapter III

Methods

Subjects

Twenty-three students from the College of Education at the University of Nebraska at Omaha were recruited for participation in this study. None of the subjects had had any formal dance training. Both males and females were recruited since gender was not an issue with studies previously conducted by Puretz (1987) and Starkes et al (1987). All of the subjects completed a medical history questionnaire and signed an informed consent form which was written in accordance to the rules and regulations of the University of Nebraska Institutional Review Board. Subjects were then placed randomly into one of two groups. Group one learned the "Mayim" folk dance with music and group two learned the "Mayim" folk dance with a metronome.

Experimental Tasks

On the subjects' first visit, they were taught the folk dance, "Mayim" by watching a videotape. Subjects in Group 1 had the folk dance music as accompaniment during the practicing of the folk dance. Subjects in Group 2 used a metronome during the practicing of the folk dance. A metronome was used as a time keeper since the subjects were being evaluated on their timing of each movement. Starkes et al. (1987) found that when subjects did not have a time keeper, movement was recalled faster than with the music condition. Each subject was then videotaped performing the folk dance a total of three times. The third performance was the trial used for analysis. This way every subject was given two practice trials to feel more comfortable and confident for their performance.

One week later, the subjects returned and were videotaped performing the folk dance again three more times. The video tapes were then analyzed by two dance educators.

Experimental Set-up Day 1

Subjects were scheduled for an individual experimental session and were told only that the experiment was about learning movement from a video. Subjects were randomly placed into one of two groups. Group 1 learned the "Mayim" dance to music while Group 2 learned the "Mayim" dance to a metronome. Each subject was asked to dress in comfortable clothing and tennis shoes. Subjects then watched an instructional video to learn the "Mayim" dance.

The Dance

The folk dance used was an Israeli folk dance called "Mayim." The dance signifies joy and thanks for the discovery of water in the desert. It has a rating of easy by the authors of the *Dance A While Handbook of Folk, Square, Contra, and Social Dance.* The arm gestures traditionally used in the dance were not taught to the subjects. Traditionally, the dance is done in a circle formation but for the purposes of this experiment, the dance was taught moving side to side instead of around the circle. The dance is broken down into four sections. (See Appendix A for complete breakdown of steps.) Section one is characterized by the grapevine step, section two by four walks forward and backward, section three by runs four times in place and section four is characterized by tapping the foot to the front and then to the side four times.

The Music

The music that accompanies the dance was the traditional folk dance music. It

was produced on record by Folkraft #1108. The music is in a 4/4 meter which means that there are four beats to every measure and the quarter receives one beat. The music does contain lyrics but they are sung in Hebrew, so that the subjects would not be able to use the words as cues. The tempo of the music is 132 beats per minute. There were sixteen beats or four measures of music for the introduction, before the dance began.

For the group that did not learn with the music, a metronome was used as a timekeeper. The metronome was set at 132 beats per minute to replicate the speed of the music.

The Instructional Video

Teaching and demonstration of the folk dance was from videotape. One of the videotapes used the music as the accompaniment for practice and the other video used the metronome as the accompaniment for practice. An instructor was videotaped demonstrating the movements facing the camera. In order to avoid confusion, the instructor used professional right and left so that the subjects could use their own right and left. Both videotapes had the exact same instructional dialogue. During the learning trial, the dance was viewed on a television monitor at approximately chest height. Consistent with common pedagogical practice, the folk dance was taught one section at a time. Each section consisted of one movement phrase. Section one used four beats to complete the grapevine movement phrase. The grapevine movement was done four times for a total of sixteen counts moving to the left. Section two took eight beats to complete the movement phrase. The movement was done two times for a total of sixteen beats. The subjects moved forward and backwards in direction. Section three took only four

beats to complete the running movement phrase and was done only one time. The subject performed the movement in place, not moving in space. Section four took eight counts to complete the movement phrase and was done twice for a total of sixteen counts. The subjects did the first eight counts moving their left leg and foot and the next eight counts moving their right leg and foot.

After the first section was taught, the subject was given three practice trials for that movement phrase before the next section was taught. Then section two was taught and this time the three practice trials began with section one and added on section two. This continued until the entire dance was taught. Each subject practiced the entire dance for a total of six times with the aid of the videotape before they were videotaped performing the dance by themselves without the aid of the video instructor. It was assumed that with each repetition, more learning was taking place. Recall trials were videotaped with a camera located near the far wall of the room. Subjects were free to move within the viewing angle of the camera which was marked on the floor. Subjects were then told to come back one week later to learn another folk dance by video. Subjects were not told that they would be re-taped performing Mayim again, to prevent, as much as possible, their devoting time to rehearsing the dance sequence physically or mentally.

Experimental Set-up Day 2

The rationale for day two of the experiment was to determine the degree to which subjects *retained* what they had learned one week earlier. For example, if learning the dance on day one was better with music, would the same group also show the best

retention of that information. Furthermore, of those who learned with music on day one, half performed the retention test on day two with music and half performed the retention test without music. The same procedure was utilized for those who initially learned with the metronome.

Subjects were asked to meet at the same time, in the same place and facing the same direction that they had been facing during the learning trials. Subjects were asked to perform the Mayim dance from memory with a five-minute rehearsal period prior to videotaping. Five of the subjects in Group 1 were able to rehearse and perform the dance with the music. The other seven subjects in Group 1 were asked to rehearse and perform the dance with only the metronome as their timekeeper. Five of the subjects in Group 2 were able to rehearse and perform with the Mayim music while six of the subjects from that same group were once again only given the metronome as the timekeeper. Each subject performed the dance three times on video and again, the third performance trial was used for analysis. See Figure I for a description of the groups.

		Day 2	
		music	metronome
Day 1	music	Group 1 Music - Music	Group 2 Music - Metronome
	metronome	Group 4 Metronome - Music	Group 3 Metronome – Metronome

Figure I. Description of Groups

The Assessment

Performance of the movement phrases and sequencing accuracy were the variables that were assessed by the qualified evaluators. The evaluators were two New York City dance educators who were trained by the author on how to score the subjects. Each judge viewed and scored the videotapes independent of one another. The assessment form that was used (See Appendix B) was designed from the coding sheet that Puretz (1987) established in her study. Each count of movement will be treated like a word from a lyric phrase. There was one movement that was correct for every beat of the music. Every subject was judged according to their proper execution of the movement, using the correct foot and correct placement of the foot, not the quality of the movement.

Data Analysis

Descriptive statistics including mean and standard deviation were calculated for the entire dance as well as each section of the dance on both day one and day two. Pearson Correlations were used to compare the scoring of the judges for all four sections of the dance to insure adequate inter-rater reliability. The 0.05 level of significance was used in all tests. The software program used for two-way analysis of variance was SPSS for MS Windows. After the judges results were compared, and an inter-rater reliability was found to be sufficient, then an analysis of variance with repeated measures was done comparing each group's scores to each other.

Chapter IV

Results

Judges' Descriptive Analysis

Twenty-three non-dancers split into four groups were used in the data analysis (14 females and 9 males). Performances were analyzed by two different judges. The judges' scores were then analyzed to determine if the two scores could be averaged in order to produce one score for each subject. Table I recaps the judges total movement scores for days 1 and 2. The judges scores were highly correlated on both day 1 and day 2($r = .895$, $r = .823$), and thus the two scores were averaged together and the new average score was used for all subsequent analysis.

Table I.

Descriptive Statistics for Judges 1 & 2 (N=23)

	Day 1 Mean* / SD	Day 2 Mean* / SD
Judge 1	96.3 (9.0)	82.9 (15.1)
Judge 2	94.4 (11.1)	83.6 (18.1)

*Total possible score was 104

Main Effects Analyses

Learning the folk dance with or without music did not produce any significant performance results ($F=.086$; $df=2,18$; $p=.918$). This did not support the hypothesis that subjects who learned the folk dance with music (day 1 mean = 94.6) would be able to execute the dance better than the subjects who learned the folk dance with the metronome (day 1 mean = 96.2). On day two, the main effect, recalling the folk dance with and without the aid of the music did produce significant differences ($F = 4.004$; $df =2,18$; $p<.036$). No significant differences were found between the groups themselves on

either day 1 or day 2. It was hypothesized that recall of movement sequences would have been greater by the groups that were given the music as their auditory tool versus the groups who were given the metronome as their auditory tool. These results do not support the hypothesis that learning with the music and recalling with the music would produce greater performance results. Figure II summarizes the group mean performance scores on day one and day two.

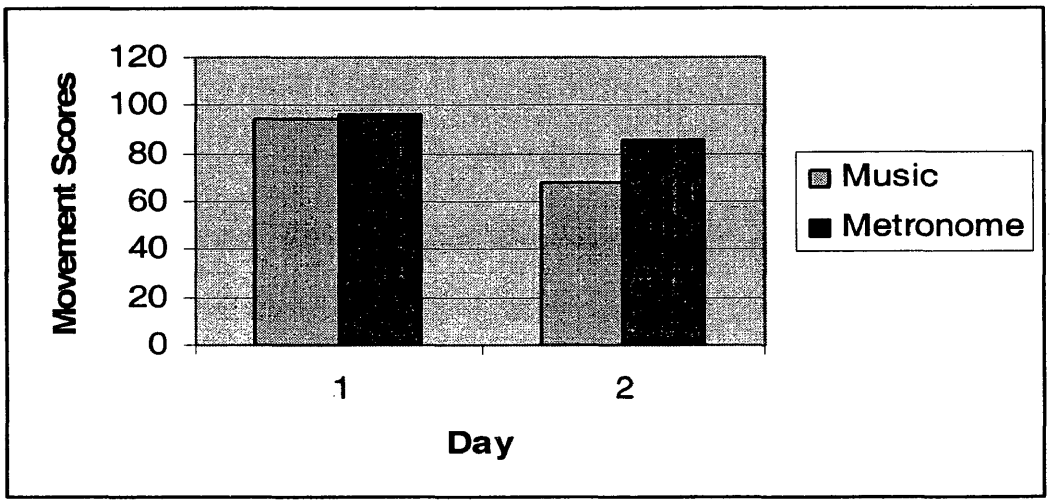

Figure II. Music and Metronome Groups Mean Performance Scores

Overall, participants performed considerably better on day 1 than on day 2. There were statistically significant differences found between the movement performance scores on day 1 and day 2 ($F=1173.3$, $p=<.05$). The overall day 1 mean was 95.3 and the overall day 2 mean was 78.8. The breakdown of the groups' total movement scores for days 1 and 2 can be found in Tables II and III.

Table II.

Descriptive Statistics of Group Movement Scores on Day 1

	n	Music	Mean*	SD	Range
Music-Music (1)	5	Yes	93.6	10.1	77.5-104.0
Music-Metronome (2)	7	Yes	95.3	11.2	76.5-104.0
Metronome-Metronome (3)	5	No	90.2	4.3	79.0-104.0
Metronome-Music (4)	6	No	101.7	11.4	93.0-104.0
Overall Mean	23		95.2		

*Total possible score was 104

Table III.

Descriptive Statistics of Group Movement Scores on Day 2

	n	Music	Mean*	SD	Range
Music-Music (1)	5	Yes	74.0	23.5	55.0-100.5
Music-Metronome (2)	7	No	83.3	17.0	60.0-104.0
Metronome-Metronome (3)	5	No	62.8	16.4	50.5-87.0
Metronome-Music (4)	6	Yes	91.5	13.0	68.5-100.0
Overall Mean	23		77.9		

*Total possible score was 104

On day one, the subjects who practiced with music had an average performance score of 94.45 and the subjects who practiced with the metronome had an average performance score of 95.95. Hence, all the subjects were able to learn the dance and perform the dance well. The overall movement performance mean on day 1 was 95.3. Although no significant differences were found between the four groups on day 2, all of the groups showed a decrease in retention performance. Figure III summarizes the descriptive results between the two groups on day 1 and the four groups on day 2.

Unlike the hypothesis that stated overall movement scores would be higher with the groups that used the music, both groups that used the metronome had the higher performance scores. Group 3, who were the subjects who learned and retained with the metronome, had the highest drop in performance scores from day one to day two. They

went from an average performance score of 90.2 down to 62.8, a difference of 27.4. Group 4, which was the group that practiced with the metronome and then retained with the music, had the least drop (a difference of 10.2) in performance scores. Group 2 which was the group who practiced with the music and recalled with the metronome dropped by 12 points and Group 1 who practiced and recalled with music had a difference of 19.6 in performance scores. It is interesting to note that groups that recalled with music (1 & 4) had a higher performance mean score than the groups that recalled with the metronome (2 & 3). It is also worthy to note that there is only a slight difference in the average performance scores on day two between the subjects who learned with music and the subjects who learned with the metronome. Groups 1 and 2 averaged 78.65 and groups 3 and 4 averaged 76.8.

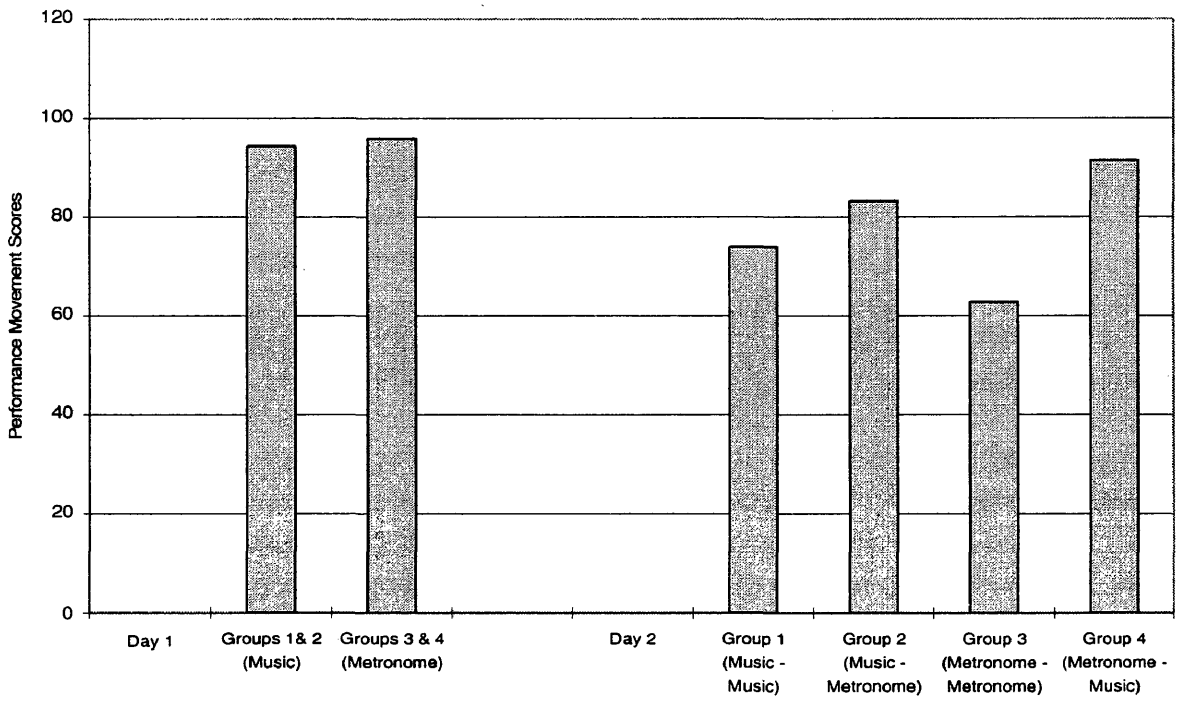

Figure III. Performance Movement results on Day 1 and Day 2

Comparisons can also be made between groups 1 and 2 and between groups 3 and 4. Although both groups 1 and 2 learned the dance to the music, group 2 had a smaller decrease in performance score than group 1 and they were the subjects who had to change their audio cues. The same phenomenon also occurred with groups 3 and 4. Both of these groups learned the dance to the metronome but group 4 who had to change audio cues and perform the dance to the music actually had a smaller decrease in performance score than group 4 who had the same audio cues. On day two, the movement performance scores of groups 1 and 4 which were the groups that recalled with music was 82.75 if averaged together. The movement performance scores of the groups that recalled with the metronome, groups 2 and 3, had an average performance score of 75.05 which was 7.7 points lower than the groups that recalled with music.

Chapter V

Discussion

The main findings in this study were that learning the folk dance with or without music did not produce any significant performance results. While no significant differences were noted in these variables, there were significant differences found between the movement performance scores on day one and day two. Results of the present study showed that there was a drop in movement performance scores from day one to day two by all subject groups. The group that learned the "Mayim" dance to music actually had a larger overall decrease in performance than the group that learned with the metronome. Thomas and Moon (1976) found that the processing of motor rhythmic information involves two separate variables (time and space) and is dependent upon proper sense mode stimulation. Therefore a person initially attempting performance tasks of a time-space rhythmic nature with a movement accuracy component should be encouraged to rely on audio cues. The measure of recall just reported is relatively conservative in that subjects had to perform each movement in its correct location with the correct foot in sequence in order to receive complete credit for correct performance. If the subjects added steps to the sequence, this hurt their score because it affected the order of the dance and thus they might not have gotten credit for actually remembering all the different dance steps, they just didn't recall the correct number of times to perform each step.

While the results of this experiment do not support the hypothesis that music will indeed act as an aid to retrieving movement memory, it does support Puretz's (1987)

findings. She found that a dance movement pattern, once entered into the long-term memory store can be physically recreated despite a lapse of several days without practice. The length of time for the recall may have needed to be longer. This may explain why there were not significant differences found in the performance movement scores from day one to day two.

Yet Starkes et al. (1987) were able to show that music did in fact act as a cue in enhancing movement recall. They found that when recall would have begun to decrease, the music appeared to provide enough cues to maintain it, at least up to eight elements. In this experiment, only four different elements were used in order to have stayed within their findings.

The inability of this investigation to show enhancement in performance recall may support the inference of several other studies (Starkes et al., 1987, Wallace, 1994, Wallace & Rubin, 1988). Wallace and Rubin (1988) found that music facilitates recall because the music acts as a framework for both encoding and retrieving a text. At retrieval, the music provides a framework that indicates how much information must be recalled, where information has been omitted and the order of the segments. Because of this framework view, folk dance music was the appropriate choice of music. The dance follows the layout of the music. When the music changes, the steps change. These interconnections between the music and the steps strengthen the memory by tying portions of the text together. However, in this experiment, there was not enough evidence to support Wallace and Rubin's theory.

A limitation in this experiment is that the music may have been too complex thus

making it more difficult for the subjects to learn and retain enough about the melody to assist in recall. In such cases, there should be no advantage for the group that learned with music versus the group that learned with the metronome. This could explain why the groups that learned with the metronome had higher recall performance scores than the group who learned with music. Similarly, Bartlett & Snelus (1980) found that recall of some lyrics is greater when the song is more recognizable.

Several limitations occurred in this study. The dance steps were new to all of the subjects and may have affected their ability to perform optimally. Subjects were given instruction and allowed to practice each of the dance steps several times before measurements were assessed. However, these were not tasks most subjects were skilled at or frequently practiced. It is not unusual for subjects to get nervous while being observed and videotaped while performing a new task. This could also have contributed to their movement performance scores. Since only the third trial was used, this may not have been the best trial performed by each subject. Consequently, some of the best performances may not have been assessed by the adjudicators.

Another limitation in this study may have been the length of time between the first visit and the second visit. If a longer length of time had gone by, different recall performances may have been given which would have supported the original hypothesis that the subjects who learned and recalled with the music would have higher performance scores.

The set-up of this study was fairly easy to administer and required a minimal amount of equipment. Practitioners may evaluate a greater number of subjects following

the methods given. Also, based on the results of the present study, professionals may want to further examine the importance of learning and practicing with music in regards to furthering one's memory for movement.

Chapter VI

Summary, Recommendations and Conclusions

Most literature in the past about movement education has been limited to working with dancers and how music can enhance memory for word phrases. As seen, there is evidence that movement recall may be facilitated by music. Typically music recall has been well correlated when the phrases being recalled match the rhythm of the music (Rubin, 1977; Bartlett et al., 1980; Wallace, 1994). More recently, studies have been done with dancers to see how well dancers recall movement with and without the use of audio cues (Starkes, 1987; Foley, 1991).

The purpose of this study was to determine if a relationship exists between nondancers who learn and then are asked to recall a folk dance leaned with music versus nondancers who learned a folk dance without music. The folk dance used was called "Mayim." The dependent variable used for analysis was movement performance scores rated by two expert movement judges. Two-way analyses of variance with repeated measures and descriptive statistics were used to determine the relationships between learning the dance with music verses learning the dance with the metronome and recalling the dance with music verses recalling the dance with the metronome.

The results of this study found that there were not any significant differences between the groups on how well they learned the dance on day one. It did not matter if the subjects learned with music or learned with the metronome. Significant differences were found between the overall movement scores from day one to day two. Movement performance scores were expected to lower since the subjects had not performed the

dance in a week's amount of time.

Further evaluation is needed to determine whether music can aid as a cue to recalling movement phrases. One aspect to ponder is what type of music can best enhance one's memory for movement. Does the music need to be more familiar in order for the learner to relate the movement sequences to the musical cues?

To evaluate the recall of movement sequences, a longer lapse of time may be required in order to get a more accurate recall account. Another recommendation for conducting this study is to increase the number of subjects in each group. Instead of only novice dancers used, a comparison between novice dancers and experienced dancers might also be interesting to look at. It would be advantageous to include an equal number of men and women in order to determine if any relationships exist between recalling movement between men and women.

It is also recommended that some type of scale be used to determine the degree of ease with which the dance is learned by subjects using music and by those using a metronome. This could be used to gauge the ease with which the dance is being learned and be used as a tool for dance and physical education teachers. Future research comparing each section of the dance would also be of value. Since section one of the dance was practiced more than section four of the dance, it would be interesting to see if section one is recalled and performed better than section one. Experienced dance, music and physical education teachers try to use auditory, verbal and observational cues when teaching a dance. Another aspect to ponder then is if less experienced teachers are giving learners enough auditory cues in order for the music to enhance their memory of the

movement sequence.

Conclusions

The following conclusions appear warranted from the results:

1. Movement performance scores decreased from day one to day two.

2. There was not a significant difference in recall by the groups that learned with music versus the groups that learned with the metronome.

The purpose of this study was to determine if music can aid in the recall and sequence of movement phrases. It was concluded that because of limitations in this study more research is needed in this area.

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APPENDIX A

Breakdown of the Mayim Folkdance

Measures	Steps	Cues
1-2	Introduction of music: no action	
	I. Grapevine	
1-4	Moving R, cross RF in front of LF accenting step (c.1), step LF to side (c.2), cross RF behind LF (c.3), step LF to side (jC.4). Repeat three times.	Front, side, back, side
	II. Forward & Back	
5	Beginning R, move forward with 3 walking steps (c.1-3). Touch the LF next to the RF (c.4).	Forward 2, 3, 4&
6	Beginning L, move backward with 3 walking steps (c.5-7). Touch the RF next to the LF (c.8).	Back 6, 7, 8
7-8	Repeat action of measures 5-6	
	III. Run	
1	Beginning R, take 4 running steps in place	Run 2, 3, 4
	IV. Toe, Touch, Front & Side	
2 side	Hop onto RF on the & count & touch the toes of the LF to front (c.1); hop on RF, touch LF toes to side (c.2); hop on RF & touch LF toes to front (c.3); hop on RF, touch LF toes to side (c. 4).	& front, side, front,
3	Repeat action of measure 2	
4 side	Hop onto LF on the & count & touch toes of the RF to front (c.1); hop on LF, touch RF toes to side (c.2); hop on LF & touch the RF toes to front (c.3); hop on LF, touch RF toes to side (c.4).	& front, side, front,
5	Repeat action of measure 4	

APPENDIX B

Mayim Assessment Form

	Section I.							
Co.	**Movement with the correct foot**			**Movement with the incorrect foot**			**Timing**	
1	RF crosses in front of LF	RF crosses behind LF	RF steps out to the R side	LF crosses in front of RF	LF crosses behind RF	LF steps out to the L side	Foot steps down on the down beat	Foot steps down on the up beat
2	Step LF to side			Step RF to side			Foot steps down on the down beat	Foot steps down on the up beat
3	RF crosses behind LF	RF crosses in front of LF	RF steps out to the R side	LF crosses behind RF	LF crosses in front of RF	LF steps out to the L side	Foot steps down on the down beat	Foot steps down on the up beat
4	Step LF to side			Step RF to side			Foot steps down on the down beat	Foot steps down on the up beat
5	RF crosses in front of LF	RF crosses behind LF	RF steps out to the R side	LF crosses in front of RF	LF crosses behind RF	LF steps out to the L side	Foot steps down on the down beat	Foot steps down on the up beat
6	Step LF to side			Step RF to side			Foot steps down on the down beat	Foot steps down on the up beat
7	RF crosses behind LF	RF crosses in front of LF	RF steps out to the R side	LF crosses behind RF	LF crosses in front of RF	LF steps out to the L side	Foot steps down on the down beat	Foot steps down on the up beat
8	Step LF to side			Step RF to side			Foot steps down on the down beat	Foot steps down on the up beat
1	RF crosses in front of LF	RF crosses behind LF	RF steps out to the R side	LF crosses in front of RF	LF crosses behind RF	LF steps out to the L side	Foot steps down on the down beat	Foot steps down on the up beat
2	Step LF to side			Step RF to side			Foot steps down on the down beat	Foot steps down on the up beat
3	RF crosses behind LF	RF crosses in front of LF	RF steps out to the R side	LF crosses behind RF	LF crosses in front of RF	LF steps out to the L side	Foot steps down on the down beat	Foot steps down on the up beat
4	Step LF to side			Step RF to side			Foot steps down on the down beat	Foot steps down on the up beat
5	RF crosses in front of LF	RF crosses behind LF	RF steps out to the R side	LF crosses in front of RF	LF crosses behind RF	LF steps out to the L side	Foot steps down on the down beat	Foot steps down on the up beat
6	Step LF to side			Step RF to side			Foot steps down on the down beat	Foot steps down on the up beat
7	RF crosses behind LF	RF crosses in front of LF	RF steps out to the R side	LF crosses behind RF	LF crosses in front of RF	LF steps out to the L side	Foot steps down on the down beat	Foot steps down on the up beat
8	Step LF to side			Step RF to side			Foot steps down on the down beat	Foot steps down on the up beat

	Section II.							
Co.	**Movement with the correct foot**			**Movement with the incorrect foot**			**Timing**	
1	RF steps forward	RF steps back		LF steps forward	LF steps back		Foot steps down on the down beat	Foot steps down on the up beat
2	LF steps forward	LF steps back		RF steps forward	RF steps back		Foot steps down on the down beat	Foot steps down on the up beat
3	RF steps forward	RF steps back		LF steps forward	LF steps back		Foot steps down on the down beat	Foot steps down on the up beat
4	LF touches next to RF (No weight)	LF steps next to RF (Wt. transfer)		RF touches next to LF (No wt.)	RF steps next to LF (Wt. transfer)		Foot steps down on the down beat	Foot steps down on the up beat
5	LF steps back	LF steps forward		RF steps back	RF steps forward		Foot steps down on the down beat	Foot steps down on the up beat
6	RF steps back	RF steps forward		LF steps back	LF steps forward		Foot steps down on the down beat	Foot steps down on the up beat
7	LF steps back	LF steps forward		RF steps back	RF steps forward		Foot steps down on the down beat	Foot steps down on the up beat
8	RF touches next to LF (No weight)	RF steps next to LF (Wt. transfer)		LF touches next to RF (No wt.)	LF steps next to RF (Wt. transfer)		Foot steps down on the down beat	Foot steps down on the up beat
1	RF steps forward	RF steps back		LF steps forward	LF steps back		Foot steps down on the down beat	Foot steps down on the up beat
2	LF steps forward	LF steps back		RF steps forward	RF steps back		Foot steps down on the down beat	Foot steps down on the up beat
3	RF steps forward	RF steps back		LF steps forward	LF steps back		Foot steps down on the down beat	Foot steps down on the up beat
4	LF touches next to RF (No weight)	LF steps next to RF (Wt. transfer)		RF touches next to LF (No wt.)	RF steps next to LF (Wt. transfer)		Foot steps down on the down beat	Foot steps down on the up beat
5	LF steps back	LF steps forward		RF steps back	RF steps forward		Foot steps down on the down beat	Foot steps down on the up beat
6	RF steps back	RF steps forward		LF steps back	LF steps forward		Foot steps down on the down beat	Foot steps down on the up beat
7	LF steps back	LF steps forward		RF steps back	RF steps forward		Foot steps down on the down beat	Foot steps down on the up beat
8	RF touches next to LF (No weight)	RF steps next to LF (Wt. transfer)		LF touches next to RF (No wt.)	LF steps next to RF (Wt. transfer)		Foot steps down on the down beat	Foot steps down on the up beat

	Section III.							
Co.	**Movement with the correct foot**			**Movement with the incorrect foot**			**Timing**	
1	Hop onto RF	Step onto RF		Hop onto LF	Step onto LF		Foot steps down on the down beat	Foot steps down on the up beat
2	Hop onto LF	Step onto LF		Hop onto RF	Step onto RF		Foot steps down on the down beat	Foot steps down on the up beat
3	Hop onto RF	Step onto RF		Hop onto LF	Step onto LF		Foot steps down on the down beat	Foot steps down on the up beat
4	Hop onto LF	Step onto LF		Hop onto RF	Step onto RF		Foot steps down on the down beat	Foot steps down on the up beat

	Section IV.							
Co.	**Movement with the correct foot**			**Movement with the incorrect foot**			**Timing**	
&	Hop onto RF	Step onto RF		Hop onto LF	Step onto LF		Foot steps down on the & beat	
1	Touch the LF toes to the front	Touch the LF toes to the side		Touch the toes of the RF to the front			Foot steps down on the down beat	Foot steps down on the up beat
2	Touch the LF toes to the side & hop on the RF	Touch the LF toes to the front	RF doesn't hop	Touch the RF toes to the side while LF hops	Touch the RF toes to the front	LF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat
3	Touch the LF toes to the front while RF hops	Touch the LF toes to the side	RF doesn't hop	Touch the RF toes to the front while LF hops	Touch the RF toes to the side	LF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat
4	Touch the LF toes to the side while RF hops	Touch the LF toes to the front	RF doesn't hop	Touch the RF toes to the side while LF hops	Touch the RF toes to the front	LF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat
5	Touch the LF toes to the front while RF hops	Touch the LF toes to the side	RF doesn't hop	Touch the RF toes to the front while LF hops	Touch the RF toes to the side	LF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat
6	Touch the LF toes to the side while RF hops	Touch the LF toes to the front	RF doesn't hop	Touch the RF toes to the side while LF hops	Touch the RF toes to the front	LF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat
7	Touch the LF toes to the front while RF hops	Touch the LF toes to the side	RF doesn't hop	Touch the RF toes to the front while LF hops	Touch the RF toes to the side	LF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat
8	Touch the LF toes to the side while RF hops	Touch the LF toes to the front	RF doesn't hop	Touch the RF toes to the side while LF hops	Touch the RF toes to the front	LF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat

	Section IV. continued							
Co.	**Movement with the correct foot**			**Movement with the incorrect foot**			**Timing**	
&	Hop onto LF	Step onto L		Hop onto RF	Step onto RF		Foot steps down on the & beat	Foot steps down on the down beat
1	Touch the RF toes to the front	Touch the RF toes to the side		Touch the toes of the LF to the front			Foot steps down on the down beat	Foot steps down on the up beat
2	Touch the RF toes to the side & hop on the LF	Touch the RF toes to the front	LF doesn't hop	Touch the LF toes to the side while RF hops	Touch the LF toes to the front	RF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat
3	Touch the RF toes to the front while LF hops	Touch the RF toes to the side	LF doesn't hop	Touch the LF toes to the front while RF hops	Touch the LF toes to the side	RF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat
4	Touch the RF toes to the side while LF hops	Touch the RF toes to the front	LF doesn't hop	Touch the LF toes to the side while RF hops	Touch the LF toes to the front	RF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat
5	Touch the RF toes to the front while LF hops	Touch the RF toes to the side	LF doesn't hop	Touch the LF toes to the front while RF hops	Touch the LF toes to the side	RF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat
6	Touch the RF toes to the side while LF hops	Touch the RF toes to the front	LF doesn't hop	Touch the LF toes to the side while RF hops	Touch the LF toes to the front	RF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat
7	Touch the RF toes to the front while LF hops	Touch the RF toes to the side	LF doesn't hop	Touch the LF toes to the front while RF hops	Touch the LF toes to the side	RF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat
8	Touch the RF toes to the side while LF hops	Touch the RF toes to the front	LF doesn't hop	Touch the LF toes to the side while RF hops	Touch the LF toes to the front	RF doesn't hop	Foot steps down on the down beat	Foot steps down on the up beat

APPENDIX C

IRB # 069-00-EP

ADULT INFORMED CONSENT FORM

RETRIEVING MOVMENT MEMORY WITH AND WITHOUT THE USE OF MUSIC

INVITATION TO PARTICIPATE

You are invited to participate in this research study. The information in this consent form is provided to help you decide whether to participate. If you have any questions, please do not hesitate to ask.

BASIS FOR SUBJECT SELECTION

You are eligible to participate in this study because you are a male or female between the ages of 19 and 35, who has not had any dance or gymnastic training outside of the regular K-12 public school curriculum and you are free of illness or injury.

PURPOSE OF THE STUDY

The purpose of this study is to investigate the effects music has on encoding and retrieving of folk dances.

EXPLANATION OF PROCEDURES

You will be asked to come to the Motor Learning Laboratory or Dance Laboratory at the University of Nebraska at Omaha HPER building to participate. You will need to plan to spend approximately 30 minutes in the lab for this activity. You will be asked to wear clothes that you can move in comfortably and tennis shoes.

You will then be asked to watch an instructional video tape and to participate in activity when the instructor on the tape asks you to take part. At the conclusion of the video tape, you will then be asked to perform the folk dance that you learned by yourself three times through. While you are performing, you will be videotaped.

One week later, you will be asked to come back to repeat this procedure. However, since you will already know the procedure, you will only have to plan to spend 20 minutes in the lab to participate.

All forms and videotapes will be stored in the primary investigator's secured office. There will be no need to release this data to any person(s) or agency.

_____Initials

IRB # 069-00-EP

POTENTIAL RISKS AND DISCOMFORTS

Possible risks and discomforts you could experience during this study include: muscle soreness, ankle sprain, dizziness, fainting, and shortness of breath.

POTENTIAL BENEFITS TO THE SUBJECT

Opportunity to participate in a research experiment and find out more about the research process. All data gathered during the study will be available for your review upon request.

POTENTIAL BENEFITS TO SOCIETY

The results of this study will improve our understanding of how different teaching techniques can be of benefit to a variety of learners. If teachers understand how music can be used as a tool for retention, this may help their students learn movement combinations better.

IN CASE OF AN EMERGENCY

If you have a research related injury or problem, you should immediately contact one of the personnel listed at the end of this consent form.

ASSURANCE OF CONFIDNETIALITY

The only persons who will have access to your research records are the study personnel, the Institutional Review Board (IRB), and any other person or agency required by law. The information from this study may be published in scientific journals or presented at scientific meetings but your identity will be kept strictly confidential.

RIGHTS OF THE RESEARCH SUBJECTS

You have rights as a research participant. These rights are explained in *The Rights of Research Participants* which you have been given. If you have any questions concerning your rights, you may contact the Institutional Review Board (IRB), telephone (402)559-6463.

_____**Initials**

VOLUNTARY PARTICIPATION AND WITHDRAWL

You can decide not to participate in this study or you can withdraw from this study at any time. Your decision will not affect your care or your relationship with the investigators, the University of Nebraska Medical Center, the Nebraska Health System (NHS) hospitals, or the University of Nebraska at Omaha. Your decision will not result in any loss of benefits to which you are entitled.

If any new information develops during the course of this study that may affect your willingness to continue participating, you will be informed immediately.

DOCUMENTATION OF INFORMED CONSENT

YOU ARE VOLUNTARILY MAKING A DECISION WHETHER TO PARTICIPATE IN THIS RESEARCH. YOUR SIGNATURE MEANS THAT YOU HAVE READ AND UNDERSTOOD THE INFORMATION PRESENTED AND DECIDED TO PARTICIPATE. YOUR SIGNATURE ALSO MEANS THAT THE INFORMATION ON THIS CONSENT FORM HAS BEEN FULLY EXPLIANED TO YOU AND ALL YOUR QUESTIONS HAVE BEEN ANSWERED TO YOUR SATISFACTION. IF YOU THINK OF ANY ADDITIONAL QUESTIONS DURING THE STUDY, YOU SHOULD CONTACT THE INVESTIAGOR(S). YOU WILL BE GIVEN A COPY OF THIS CONSENT FORM.

_____ _____

SIGNATURE OF PARTICIPANT **DATE**

I CERTIFY THAT ALL ELEMENTS OF INFORMED CONSENT DESCRIBED ON THIS CONSENT FORM HAVE BEEN EXPLAINED FULLY TO THE PARTICIPANT. IN MY JUDGEMENT, THE PARTICIPANT IS VOLUNTARILY AND KNOWINGLY GIVING INFORMED CONSENT AND POSSESSES THE LEGAL CAPACITY TO GIVE INFORMED CONSENT TO PARTICIPATE IN THIS RESEARCH.

_____ _____

SIGNATURE OF INVESTIGATOR **DATE**

IRB # 069-00-EP

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